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EXAMINER	
TANG, KUO LIANG J	

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2122	3

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/703,527	ARNOLD ET AL.	
	Examiner	Art Unit	
	Kuo-Liang J Tang	2122	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10-15-2003* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-36* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-36* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *2* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-3, 6-8, 10, 12, 25-27, 30, 32 and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dean et al. (US Patent No. 6,374,367) hereafter Dean, in view of Dean et al. (US Patent No. 6,070,009) hereafter Dean01.

3. ***As Per Claim 1***, Dean disclosed:

a) identifying one or more instances of yield points, each said yield point indicating a potential sampling operation;(see Column 4, Lines 60-63, "The marker 230 **identifies** a transaction as a selected transaction T' 103 whenever the counter overflows (or underflows).").

b) during program execution, in response to an identified yield point instance, ascertaining a state of said execution environment for indicating whether a sampling operation is to be performed; (see Column 4, Lines 24-31, "Therefore, the trigger 210 receives the transactions 101, events 104, and state 130, depending on the particular functional unit which is sampled. The current transaction information, the events, and **state** are **logically combined** by the trigger 210 using a function, for example, a logical function including Boolean operators (AND, OR, NOT). If the result of the combination is true, then the counter 220 is enabled for counting, otherwise, if false, then it is not.") and (see Column 5, Lines 1-7, "The marker 230 is also configured so that it can receive events 104 and state 130, as well as the transactions. The job of the marker 230 is to

determine whether the current transaction is of interest for sampling at the time that marking is triggered due to the counter 220 overflowing, if not, than the transaction can be ignored, and the counter can be reset."), ***and,***

c) when state of said execution environment indicates a sampling operation, recording relevant information for characterizing behavior of said execution environment. (see Column 5, Lines 40-43, "Some state information can be **recorded** before the transaction is processed by the functional unit to capture an initial state, and additional information can be **recorded** after the transaction completes to capture a final state.").

Dean didn't explicitly disclose the sampling is performed in a software program. However, Dean01 teaches ***a) identifying one or more instances of yield points in a program to be executed, each said yield point indicating a potential sampling operation during execution of said program;*** (see Column 12, Lines 7-16, "As an advantage of the present sampling technique, all "instructions" processed by the pipeline 200 have an equal probability of being selected for **sampling,** independent of the sampling rate. The instructions can be valid instructions, invalid instructions, non-interruptible instructions, or "garbage" instructions. Thus, the captured effective addresses are statistically representative of the overall behavior of the **program**. By capturing the effective addresses of sampled instructions, memory accesses and execution flows can precisely be correlated to actual dynamic **executions**."). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teaching of Dean01 into the system of Dean, to have the sampling been performed in a software program. The modification would have been obvious because one of ordinary skill in the art would have been motivated to sample the program so that the behavior of program can be statistically represented by capturing the effective address.

4. ***As Per Claim 2***, the rejection of claims 1 is incorporated and further Dean disclosed:

-sampling operation includes identifying a method currently executing in said program, said method including tracking frequencies of methods executed in said program for characterizing said program

behavior. (see Column 5, Lines 43-49, "After a specified **number of transactions** have been recorded, for example, when the sampling buffer is full, **a read signal can be generated**. The read signal can be in the form of an interrupt, a software pollable value set in a register, or an exception condition. The read signal can enable software to read the sampled data for further processing.") and (see Column 4, Lines 54-59, "In another useful example, one can trigger marking after a transaction originating from a particular context, such as a processor, a process thread, and I/O interface, and then **gather samples** for a specified **number of subsequent transactions**, or a specified amount of time.").

5. ***As Per Claim 3***, the rejection of claims 2 is incorporated and further Dean disclosed:

-sampling operation includes identifying a calling context associated with methods called by said program, said method including tracking calling context frequency for characterizing said program behavior. (see Column 4, Lines 54-59, "In another useful example, one can trigger marking after a transaction originating from a particular **context**, such as a processor, a process thread, and I/O interface, and then gather samples for a specified **number of subsequent transactions**, or a specified amount of time.").

6. ***As Per Claim 6***, the rejection of claims 1 is incorporated and further Dean disclosed:

-said state of said execution environment does not indicate a sampling operation, the step of executing a next instruction in said executing program after said identified yield point. (see Column 4, Lines 24-31, "Therefore, the trigger 210 receives the transactions 101, events 104, and state 130, depending on the particular functional unit which is sampled. The current transaction information, the events, and **state** are logically combined by the trigger 210 using a function, for example, a logical function including Boolean operators (AND, OR, NOT). If the result of the combination is true, then the counter 220 is enabled for counting, otherwise, **if false, then it is not**.") and (see Column 13, Lines 8-12, "Similarly, in order to perform trace scheduling of instructions, a compiler needs control-flow graph edge or path frequencies. A **trace** scheduler

might do an even better job when it has an estimate of how long it took to execute each **basic block** or a larger execution path.").

7. ***As Per Claim 7***, the rejection of claims 1 is incorporated and further Dean disclosed:

-ascertaining a state of said execution environment includes checking status of a trigger bit set by said execution environment to indicate performance of said sampling operation. (see Column 4, Lines 24-31, "Therefore, the trigger 210 receives the transactions 101, events 104, and **state 130**, depending on the particular functional unit which is sampled. The current transaction information, the events, and state are logically combined by the **trigger** 210 using a function, for example, a logical function including Boolean operators (AND, OR, NOT). If the result of the combination is **true**, then the counter 220 is enabled for counting, otherwise, if **false**, then it is not.").

8. ***As Per Claim 8***, the rejection of claims 1 is incorporated and further Dean disclosed:

- said trigger bit status is set periodically by said executing environment.. (see Column 4, Lines 15-19, "The counter **event signal** 225 can be **selected** from one or more event signals (event1, event2, event3) 104 by a count select signal **on line 229**. The **event signals 104** can include **clock cycles**, transactions available for processing, transactions accepted for processing, and so forth.").

9. ***As Per Claim 10***, the rejection of claims 2 is incorporated and further Dean disclosed:

-identifying a currently executing method comprises determining an instruction address at which the yield point was taken and mapping that address to a called method. (see Column 5, Lines 8-21, "The various functions that actually cause the marker 230 to select a transaction include, but are not limited to, transactions that reference a particular level in the memory hierarchy, references to a particular region of memory within a particular level of the memory hierarchy, transactions of a particular type, e.g., branch instructions, transactions

having an associated event, e.g., a miss, a branch mispredict, an abort, a particular state transition, e.g., dirty evictions, transactions originating from a particular source, e.g., an instruction executing in the processor pipeline, an instruction execution from a particular context, process, thread, or **address space**, direct memory access from an input/output interface, cache coherency messages in a multiprocessor computer system, and so forth.").

10. ***As Per Claim 12***, the rejection of claims 1 is incorporated and further Dean disclosed:

-implementing a compiler device for inserting one or more yield points in said program. (see Column 13, Lines 15-22, "Many **compiler** optimizations, such as trace scheduling and hot-cold optimization rely on knowing which execution **paths** are frequently taken through a **program**. These are called "hot" paths. Until recently, frequently executed paths were inferred by **profiling the program**, either through instrumentation or simulation, to gather basic block or edge counts, and then, using these counts, to indirectly **infer the hot and cold paths**.").

11. ***As Per Claim 25***, Dean disclosed:

a) mechanism for identifying instances of yield points; (see Column 4, Lines 60-63, "The marker 230 **identifies** a transaction as a selected transaction T' 103 whenever the counter overflows (or underflows).").

b) control device for determining a condition for performing a sampling operation of said executing program at an identified yield point instance; (see Column 4, Lines 24-31, "Therefore, the trigger 210 receives the transactions 101, events 104, and state 130, depending on the particular functional unit which is sampled. The current transaction information, the events, and state are logically combined by the trigger 210 using a function, for example, a logical function including Boolean operators (AND, OR, NOT). If the result of the combination is true, then the counter 220 is enabled for counting, otherwise, if false, then it is not.") and (see Column 5, Lines 1-7, "The marker 230 is also configured so that it can receive events 104 and state 130, as well

as the transactions. The job of the marker 230 is to determine whether the current transaction is of interest for sampling at the time that marking is triggered due to the counter 220 overflowing, if not, than the transaction can be ignored, and the counter can be reset."),***and,***

c) sampling device for performing said sampling operation of said executing program upon satisfaction of said condition, and recording relevant information for characterizing behavior of said execution environment in response to said sampling. (see Column 5, Lines 40-43, "Some state information can be **recorded** before the transaction is processed by the functional unit to capture an initial state, and additional information can be **recorded** after the transaction completes to capture a final state.").

Dean didn't explicitly disclose the sampling is performed in a software program. However, Dean01 teaches ***a) mechanism for identifying instances of yield points inserted in an executing progra;*** as claimed (see Column 12, Lines 7-16, "As an advantage of the present sampling technique, all "instructions" processed by the pipeline 200 have an equal probability of being selected for **sampling,** independent of the sampling rate. The instructions can be valid instructions, invalid instructions, non-interruptible instructions, or "garbage" instructions. Thus, the captured effective addresses are statistically representative of the overall behavior of the **program**. By capturing the effective addresses of sampled instructions, memory accesses and execution flows can precisely be correlated to actual dynamic **executions**."). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teaching of Dean01 into the system of Dean, to have the sampling been performed in a software program. The modification would have been obvious because one of ordinary skill in the art would have been motivated to sample the program so that the behavior of program can be statistically represented by capturing the effective address.

12. ***As Per Claim 26***, the rejection of claims 25 is incorporated and is rejected under the same reason set forth in connection of the rejection of claim 2.

13. ***As Per Claim 27***, the rejection of claims 26 is incorporated and is rejected under the same reason set forth in connection of the rejection of claim 3.

14. ***As Per Claim 30***, the rejection of claims 25 is incorporated and is rejected under the same reason set forth in connection of the rejection of claim 8.

15. ***As Per Claim 32***, the rejection of claims 26 is incorporated and is rejected under the same reason set forth in connection of the rejection of claim 10.

16. ***As Per Claim 35***, the rejection of claims 25 is incorporated and is rejected under the same reason set forth in connection of the rejection of claim 12.

17. Claims 9 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dean et al. (US Patent No. 6,374,367) hereafter Dean, in view of Dean et al. (US Patent No. 6,070,009) hereafter Dean01, further in view of Bala (US Patent No. 6,351,844).

As Per Claim 9, the rejection of claims 8 is incorporated and further Dean disclosed ***invoking a runtime system interrupt at periodic time intervals;*** (see Column 4, Lines 15-19, "The counter **event signal** 225 can be **selected** from one or more event signals (event1, event2, event3) 104 by a count select signal **on line 229**. The **event signals 104** can include **clock cycles**, transactions available for processing, transactions accepted for processing, and so forth."; clock cycle is a periodic time interval) and (see Column 5, Lines 46-49, "The read signal can be in the form of **an interrupt**, a software pollable value set in a register, or an exception condition.

The read signal can enable software to read the sampled data for further processing."). Dean and Dean01didn't explicitly disclose implementing an interrupt handler. However, Bala teaches ***implementing an interrupt handler mechanism for catching said interrupt and setting said trigger bit.*** (see Column 5, Lines 62-67 to Column 6, Lines 1-3, "The program code is run under control of a profiler program, the profiler program makes operating system calls to set up a timer interrupt, and registers an **interrupt handler** procedure. When a timer interrupt occurs, the operating-system invokes the handler and gives the handler the machine state and the last trace executed data at the instant of the interrupt. The handler then records this information and any other relevant information (which may include updating a counter associated with the trace)."). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teaching of Bala into the system of Dean and Dean01, to implemen an interrupt handler. The modification would have been obvious because one of ordinary skill in the art would have been motivated to handle interrupts properly.

18. ***As Per Claim 31***, the rejection of claims 30 is incorporated and is rejected under the same reason set forth in connection of the rejection of claim 9.

19. Claims 4-5 and 28-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dean et al. (US Patent No. 6,374,367) hereafter Dean, in view of Dean et al. (US Patent No. 6,070,009) hereafter Dean01, further in view of Brown et al. (US Patent No. 4,853,884) hereafter Brown.

20. ***As Per Claim 4,*** the rejection of claims 1 is incorporated and further Dean and Dean01 didn't explicitly disclose identifying variable being tracked. However, Brown teaches ***sampling operation includes identifying current program variable values, said program variable values being tracked for characterizing said program***

behavior. (see Column 6, Lines 3-18, "Beginning with start block 201, the controller initializes the **variables ONES, ZEROS, and SCOUNT** to zero in block 202. At block 203, the random pulse stream at 175 is sampled and 8 bits of the resultant bit stream are input. In block 204, the number of ones bits of the 8-bit sample are counted and added into the variable ONES, and in block 205 the number of zero bits are counted and added to the variable ZEROS. The **variable SCOUNT**, which is used to keep **track** of the number of samples since the last adjustment of the D/A, is incremented. SCOUNT is then tested in block 207. If the number of samples is less than 16, i.e., 128 bits, then the program returns to block 203 to sample another 8 bits. This sample counting is performed to ensure that enough bits are sampled to make a valid randomness decision."). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teaching of Brown into the system of Dean and Dean01, to use an variable to track sampling operations. The modification would have been obvious because one of ordinary skill in the art would have been motivated to ensure that enough bits are sampled to make a valid randomness decision.

21. ***As Per Claim 5,*** the rejection of claims 1 is incorporated and further Dean and Dean01 didn't explicitly disclose tracking a frequency of basic blocks. However, Brown teaches ***sampling operation includes identifying basic blocks executed in said program, said method including tracking a frequency of basic blocks for characterizing said program behavior.*** (see Column 6, Lines 19-36, "Upon the completion of counting the ones and zeros of 16 8-bit samples, the ONES variable is **tested against** the ZEROS variable in **block 208** If the number of ones in the 128 bits is more than a predefined limit over the number of zeros, then the microprocessor will decrement the D/A converter in block 09 to lower control voltage 133. Conversely, in **block 210**, the number of zeros is tested to see if it is more than a predefined limit over the number of ones. If so, the microprocessor will increment the D/A converter in block 211 to raise control voltage 133. If the difference between the ONES and the ZEROS is less than the prescribed limit, then the D/A is not adjusted and

the most recent 8-bit sample is output in block 212. If more than 8 bits are required at a time, then the 8-bit number would be stored in RAM until enough 8-bit numbers are accumulated. Control then returns to block 203 to input another 8-bit sample."). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teaching of Brown into the system of Dean and Dean01, to tracking a frequency of basic blocks. The modification would have been obvious because one of ordinary skill in the art would have been motivated to adjust control voltage.

22. ***As Per Claim 28***, the rejection of claims 25 is incorporated and is rejected under the same reason set forth in connection of the rejection of claim 4.

23. ***As Per Claim 29***, the rejection of claims 25 is incorporated and is rejected under the same reason set forth in connection of the rejection of claim 5.

24. Claims 11 and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dean et al. (US Patent No. 6,374,367) hereafter Dean, in view of Dean et al. (US Patent No. 6,070,009) hereafter Dean01, further in view of McDevitt et al. (US Patent No. 6,266,678) hereafter McDevitt.

25. ***As Per Claim 11***, the rejection of claim 3 is incorporated and further Dean and Dean01 didn't disclose inspecting a call-back run-time data structure. However, McDevitt teaches ***inspecting a call-stack runtime data structure for tracking methods currently active in said executing program.*** (see Column 11, Lines 15-26, "At step 412, the data file is opened and the contents of the data file are retrieved and buffered for transmission to the user. In addition, other information may also be buffered at this time, such as the file size, access information, the data address of the last data field or data record in the data file, or other suitable data. The

method then proceeds to step 414, where a **call back** service is initiated. The call back service typically **tracks** the user requesting access to **the data file**, and **ensures that updates to the data file are transferred to the user**. The initial status of the data file may also be transmitted to the user at step 414. The method then proceeds to step 416."). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teaching of McDevitt into the system of Dean and Dean01 to inspect a call-back run-time data structure. The modification would have been obvious because one of ordinary skill in the art would have been motivated to initiate call-back to check changes in file stats.

26. ***As Per Claim 33***, the rejection of claims 27 is incorporated and is rejected under the same reason set forth in connection of the rejection of claim 11.

27. Claims 13, 15-17, 20, 21, 24, 34 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dean et al. (US Patent No. 6,374,367) hereafter Dean, in view of Dean et al. (US Patent No. 6,070,009) hereafter Dean01, further in view of Holzle al. (US Patent No. 5,995,754) hereafter Holzle.

28. ***As Per Claim 13***, the rejection of claim 1 is incorporated and further Dean and Dean01 didn't disclose an interpreter device. However, Holzle teaches ***implementing an interpreter device for ensuring execution of said yield points in said program.*** (see Column 5, Lines 66-67 to Column 6, Lines 1-6, "When byte codes 144 are provided to computer system 146, byte codes 144 may be processed with an **interpreter 148**. Alternatively, byte codes 144 may be compiled by a compiler 150 to produce compiled code. Although byte codes 144 may generally be inputted substantially directly to both **interpreter 148** and compiler 150, in the described embodiment, byte codes 144 are provided only to **interpreter 148** for processing."). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teaching of

Holzle into the system of Dean and Dean01 to implement an interpreter device for ensuring execution of said yield points in said program. The modification would have been obvious because one of ordinary skill in the art would have been motivated to interprete various methods.

29. ***As Per Claim 15***, Dean disclosed:

a) identifying one or more instances of yield points, each said yield point indicating a potential sampling operation; (see Column 4, Lines 60-63, "The marker 230 **identifies** a transaction as a selected transaction T' 103 whenever the counter overflows (or underflows).").

d) in response to meeting said threshold, performing a sampling operation of said executing program, and, recording relevant information for characterizing behavior of said execution environment in response to said sampling. (see Column 5, Lines 40-43, "Some state information can be **recorded** before the transaction is processed by the functional unit to capture an initial state, and additional information can be **recorded** after the transaction completes to capture a final state.").

Dean didn't explicitly disclose in an executing program. However, Dean01 teaches ***a) identifying one or more instances of yield points inserted in a executing program, each said yield point indicating a potential sampling operation during execution of said program*** as claimed (see Column 12, Lines 7-16, "As an advantage of the present sampling technique, all "instructions" processed by the pipeline 200 have an equal probability of being selected for **sampling,** independent of the sampling rate. The instructions can be valid instructions, invalid instructions, non-interruptible instructions, or "garbage" instructions. Thus, the captured effective addresses are statistically representative of the overall behavior of the **program**. By capturing the effective addresses of sampled instructions, memory accesses and execution flows can precisely be correlated to actual dynamic **executions**."). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teaching of Dean01 into the system of Dean, in an executing

program. The modification would have been obvious because one of ordinary skill in the art would have been motivated to statistically represent the behavior of program by capturing the effective address.

Dean and Dean01 didn't disclose counting a number of identified yield points. However, Holzle teaches ***b) counting a number of identified yield points;*** (see Column 2, Lines 52-57, "In the Self system, the determination of whether to re-compile previously compiled code is made based on how many times a specific portion of compiled code, such as a method, has been called. If the method has been invoked more times than a fixed limiting value, then the method is re-compiled."). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teaching of Holzle into the system of Dean and Dean01 to count identified yield points. The modification would have been obvious because one of ordinary skill in the art would have been motivated to collect right amount of samples.

Dean and Dean01 didn't disclose comparing the number of samples to a predetermined threshold. However, Holzle teaches ***c) comparing said number against a predetermined threshold.*** (see Column 2, Lines 56-60, "If the method has been invoked **more times than a fixed limiting value**, then the method is re-compiled. The fixed limiting value is essentially a fixed **threshold**, which reflects the number of times the method is to be invoked before the method is re-compiled to increase efficiency in execution."). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teaching of Holzle into the system of Dean and Dean01 to compare a threshold value. The modification would have been obvious because one of ordinary skill in the art would have been motivated save the system resource by reducing the method recompilation times only when the number is greater than the threshold value.

30. ***As Per Claim 16***, the rejection of claims 15 is incorporated and is rejected under the same reason set forth in connection of the rejection of claim 2.

31. ***As Per Claim 17***, the rejection of claims 16 is incorporated and is rejected under the same reason set forth in connection of the rejection of claim 3.

32. ***As Per Claim 20,*** the rejection of claims 15 is incorporated and further Dean disclosed:

-initializing a counter to said predetermined threshold; (see Column 4, Lines 1-8, "The counter 220 is set and **reset (initialized) with a value** (init value) 221 on line 222. The value 221 can be generated by hardware (HW) 223 or software (SW) 224. As will be described below, the value 221, in part, determines a rate of sampling, small initial values increase the rate of sampling, and large values decrease the rate of sampling. If **the counter counts down**, then small initial values increase the rate of sampling and large initial values decrease the rate.").

Dean and Dean01 didn't explicitly disclose initializing counter to threshold value and decrementing the counter to zero. However, Holzle teaches ***for each identified yield point instance, decrementing said counter until said counter is zero, whereby said sampling operation is arranged such that a fixed percentage of all executed yield points are taken.*** (see Column 8, Lines 19-33, "A determination is made in step 412 as to whether the counter for method M exceeds the threshold. If the counter for method M does not exceed the threshold, then the indication is that it is not necessary to compile method M. Accordingly, process flow moves from step 412 to step 416 in which method M is executed with an interpreter. Alternatively, if the determination in step 412 is that the counter for method M exceeds the threshold, then the implication is that the execution of the overall program may be more efficient if method M were compiled, rather than interpreted. As such, when it is determined that the counter for method M exceeds the threshold, a recompiler is executed in step 420. The steps associated with executing a recompiler will be described in more detail below with reference to FIG. 5."). The examiner interprets that it has the same result when the counter is incremented from zero to a fixed value as well as when the counter is decremented from a fixed value to zero. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teaching of Holzle into the

system of Dean and Dean01, to use counter and threshold. The modification would have been obvious because one of ordinary skill in the art would have been motivated to save the system resource by reducing sampling operations only when the number of times of counter updated is equal to the threshold value.

33. ***As Per Claim 21***, the rejection of claims 16 is incorporated and is rejected under the same reason set forth in connection of the rejection of claim 10.

34. ***As Per Claim 24***, the rejection of claims 15 is incorporated and is rejected under the same reason set forth in connection of the rejection of claim 13.

35. ***As Per Claim 34,*** the rejection of claims 25 is incorporated and further Dean disclosed:

-counter device for counting a number of identified yield points; (see Column 4, Lines 1-8, "The **counter** 220 is set and reset (initialized) with a value (init value) 221 on line 222. The value 221 can be generated by hardware (HW) 223 or software (SW) 224. As will be described below, the value 221, in part, determines a rate of sampling, small initial values increase the rate of sampling, and large values decrease the rate of sampling. If the counter counts down, then small initial values increase the rate of sampling and large initial values decrease the rate.").

Dean and Dean01 didn't explicitly disclose initializing counter to threshold value and decrementing the counter to zero. However, Holzle teaches ***and, device for comparing said number against a predetermined threshold value, wherein, in response to meeting of said threshold, said control device initiating performing of said sampling operation.*** (see Column 8, Lines 19-33, "A determination is made in step 412 as to whether the counter for method M exceeds the threshold. If the counter for method M does not exceed the threshold, then the indication is that it is not necessary to compile method M. Accordingly, process flow moves from step 412 to step 416 in which method M is executed with an interpreter. Alternatively, if the determination in step

412 is that the counter for method M exceeds the threshold, then the implication is that the execution of the overall program may be more efficient if method M were compiled, rather than interpreted. As such, when it is determined that the counter for method M exceeds the threshold, a recompiler is executed in step 420. The steps associated with executing a recompiler will be described in more detail below with reference to FIG. 5."). The examiner interprets that it has the same result when the counter is incremented from zero to a fixed value as well as when the counter is decremented from a fixed value to zero. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teaching of Holzle into the system of Dean and Dean01, to use counter and threshold. The modification would have been obvious because one of ordinary skill in the art would have been motivated to save the system resource by reducing sampling operations only when the number of times of counter updated is equal to the threshold value.

36. ***As Per Claim 36***, the rejection of claims 25 is incorporated and is rejected under the same reason set forth in connection of the rejection of claim 13.

37. Claims 18-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dean et al. (US Patent No. 6,374,367) hereafter Dean, in view of Dean et al. (US Patent No. 6,070,009) hereafter Dean01, further in view of Holzle al. (US Patent No. 5,995,754) hereafter Holzle, further in view of Brown et al. (US Patent No. 4,853,884) hereafter Brown.

38. ***As Per Claim 18,*** the rejection of claims 15 is incorporated and further Dean, Dean01 and Holzle didn't explicitly disclose identifying variable being tracked. However, Brown teaches ***sampling operation includes identifying current program variable values, said program variable values being tracked for characterizing said program behavior.*** (see Column 6, Lines 3-18, "Beginning with start block 201, the controller initializes

the **variables ONES, ZEROS, and SCOUNT** to zero in block 202. At block 203, the random pulse stream at 175 is sampled and 8 bits of the resultant bit stream are input. In block 204, the number of ones bits of the 8-bit sample are counted and added into the variable ONES, and in block 205 the number of zero bits are counted and added to the variable ZEROS. The **variable SCOUNT**, which is used to keep **track** of the number of samples since the last adjustment of the D/A, is incremented. SCOUNT is then tested in block 207. If the number of samples is less than 16, i.e., 128 bits, then the program returns to block 203 to sample another 8 bits. This sample counting is performed to ensure that enough bits are sampled to make a valid randomness decision."). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teaching of Brown into the system of Dean, Dean01 and Holzle, to use an variable to track sampling operations. The modification would have been obvious because one of ordinary skill in the art would have been motivated to ensure that enough bits are sampled to make a valid randomness decision.

39. ***As Per Claim 19,*** the rejection of claims 15 is incorporated and further Dean, Dean01 and Holzle didn't explicitly disclose tracking a frequency of basic blocks. However, Brown teaches ***sampling operation includes identifying basic blocks executed in said program, said method including tracking a frequency of basic blocks for characterizing said program behavior.*** (see Column 6, Lines 19-36, "Upon the completion of counting the ones and zeros of 16 8-bit samples, the ONES variable is **tested against** the ZEROS variable in **block 208** If the number of ones in the 128 bits is more than a predefined limit over the number of zeros, then the microprocessor will decrement the D/A converter in block 09 to lower control voltage 133. Conversely, in **block 210**, the number of zeros is tested to see if it is more than a predefined limit over the number of ones. If so, the microprocessor will increment the D/A converter in block 211 to raise control voltage 133. If the difference between the ONES and the ZEROS is less than the prescribed limit, then the D/A is not adjusted and the most recent 8-bit sample is output in block 212. If more than 8 bits are required at a time, then the 8-bit

number would be stored in RAM until enough 8-bit numbers are accumulated. Control then returns to block 203 to input another 8-bit sample."). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teaching of Brown into the system of Dean, Dean01 and Holzle, to tracking a frequency of basic blocks. The modification would have been obvious because one of ordinary skill in the art would have been motivated to adjust control voltage.

40. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dean et al. (US Patent No. 6,374,367) hereafter Dean, in view of Dean et al. (US Patent No. 6,070,009) hereafter Dean01, further in view of Alpern et al. "The Jalapeño Virtual Machine", IBM System Journal, Vol 39, No 1, February 2000, hereafter Alpern.

41. ***As Per Claim 14***, the rejection of claim 1 is incorporated and further Dean and Dean01 didn't disclose method prologue and back edge yield points. However, Alpern teaches ***yield points are inserted in one or more program locations including: a method prologue and a loop back edge.*** (see Page 222, left hand column, Line2 35-46, "The code produced by all three compilers must satisfyJalapen˜o's calling and preemption conventions. They ensure that threads executing the methods they compile will respond in a timely manner to attempts to preempt them. Currently, explicit yield points are compiled into **method prologues**. Eventually, **yield points** will be needed on the "**back edges**" of **loops** that cannot be shown to contain other yield points."). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teaching of Alpern into the system of Dean and Dean01 to use method prologue and back edge yield points. The modification would have been obvious because one of ordinary skill in the art would have been motivated to take profile data samples.

42. Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dean et al. (US Patent No. 6,374,367) hereafter Dean, in view of Dean et al. (US Patent No. 6,070,009) hereafter Dean01, further in view of Holzle al. (US Patent No. 5,995,754) hereafter Holzle, further McDevitt et al. (US Patent No. 6,266,678) hereafter McDevitt.

43. ***As Per Claim 22***, the rejection of claim 17 is incorporated and further Dean, Dean01 and Holzle didn't disclose inspecting a call-back run-time data structure. However, McDevitt teaches ***inspecting a call-stack runtime data structure for tracking methods currently active in said executing program.*** (see Column 11, Lines 15-26, "At step 412, the data file is opened and the contents of the data file are retrieved and buffered for transmission to the user. In addition, other information may also be buffered at this time, such as the file size, access information, the data address of the last data field or data record in the data file, or other suitable data. The **method** then proceeds to step 414, where a **call back** service is initiated. The call back service typically **tracks** the user requesting access to **the data file**, and **ensures that updates to the data file are transferred to the user**. The initial status of the data file may also be transmitted to the user at step 414. The method then proceeds to step 416."). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teaching of McDevitt into the system of Dean , Dean01 and Holzle to inspect a call-back run-time data structure. The modification would have been obvious because one of ordinary skill in the art would have been motivated to initiate call-back to check changes in file stats.

44. Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dean et al. (US Patent No. 6,374,367) hereafter Dean, in view of Dean et al. (US Patent No. 6,070,009) hereafter Dean01, further in view of Holzle al. (US Patent No. 5,995,754) hereafter Holzle, further in view of Alpern et al. "The Jalapeño Virtual Machine", IBM System Journal, Vol 39, No 1, February 2000, hereafter Alpern.

45. ***As Per Claim 23***, the rejection of claim 15 is incorporated and further Dean, Dean01 and Holzle didn't disclose method prologue and back edge yield points. However, Alpern teaches ***yield points are inserted in one or more program locations including: a method prologue and a loop back edge.*** (see Page 222, left hand column, Line 35-46, "The code produced by all three compilers must satisfy Jalapen˜o's calling and preemption conventions. They ensure that threads executing the methods they compile will respond in a timely manner to attempts to preempt them. Currently, explicit yield points are compiled into **method prologues**. Eventually, **yield points** will be needed on the "**back edges**" of **loops** that cannot be shown to contain other yield points."). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teaching of Alpern into the system of Dean, Dean01 and Holzle to use method prologue and back edge yield points. The modification would have been obvious because one of ordinary skill in the art would have been motivated to take profile data samples.

Conclusion

46. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

47. **Title**: Recording in a program execution profile references to a memory-mapped active device . **USPN**: 6,397,379.

48. **Title**: Method and apparatus of translating and executing native code in a virtual machine environment. **USPN**: 6,282,702.

49. **Title**: Determination of local variable type and precision in the presence of subroutines. **USPN**: 6,442,751.

50. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kuo-Liang J Tang whose telephone number is 703-305-4866. The examiner can normally be reached on M-F 8:30 to 5:00.

51. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tuan Q Dam can be reached on 703-305-4552.

52. Any response to this action should be mailed to:

Commissioner of Patents and Trademarks

Washington, D.C. 20231

or faxed to:

(703) 872-9306, (for formal communications intended for entry)

or: (703) 872-9306 (for informal or draft communications, please label "**PROPOSED**" or "**DRAFT**")

53. Hand-delivered response should be brought to Crystal Park II, 2121 Crystal Drive, Arlington, VA. , 22202. 4th Floor(Receptionist).

KLT / KLT

October 15, 2003

WEI ZHEN
Primary Patent Examiner